

of time the Crag suffered considerable erosion. This erosion in places laid bare the sub-Crag Stone Bed, and it would seem that the land surface then existing was inhabited by the makers of the ochreous specimens, who proceeded to use the large, sound pre-Crag flints in implement-making. In support of these conclusions it may be mentioned that in "The Pliocene Deposits of Britain" (p. 40) Mr. Clement Reid states: "There seem never to be more than a few feet of Crag beneath the Forest Bed." Again (p. 149) he states: "It is not improbable that there may also be another land surface beneath the Lower Fresh-water Bed, for in one place the Weybourn Crag below the Forest Bed has a rather weathered appearance; but of this one cannot be certain." Further (p. 151) it is stated: "The making of trial borings in 1886 and 1888 showed that the eroded surface beneath the deposit [the Forest Bed] was one of the most marked features, and that there was always a more or less gravelly base to the Forest Bed, beneath which the Crag was cut into by numerous channels or hollows."

As patches of Weybourn Crag are still to be seen near the workshop site at Cromer, and as a very careful search has failed to discover any flints of the same order and colour either in the Stone Bed, where it is exposed at West Runton and Sheringham, or in the upper strata of the Cromer Forest Bed series, it is concluded that the ochreous specimens now described are referable to the earliest member of this series, and are represented elsewhere, in all probability, by the "gravelly base" mentioned by Mr. Clement Reid. I have been able to ascertain that the Stone Bed extends for some distance underneath the shingle beach, and, if excavations could be made, would no doubt be found to occur under the cliff itself. The seaward termination of the shingle beach, where the Stone Bed outcrops, is about 86 yards from the foot of the cliff, and it can be regarded as in every way probable that the workshop site, at present exposed, was covered by the cliff one hundred years ago. In fact, the rate of recession of the cliffs to the south-east of Cromer is much in excess of that allowed for in this estimate. All the above conclusions regarding the geological age of the workshop site and the recession of the cliff at this part of the coast are shown diagrammatically in Fig. 1. It would appear that the sea is gradually uncovering and removing many of the ochreous implements and flakes, as to the south-east of Cromer a number of such specimens may be found upon the shore. These examples exhibit marked signs of rolling and the effects of what is known as "beach action."

The first discovery of flaked flints, claimed as being of human origin, in the Cromer Forest Bed was made by Mr. W. J. Lewis Abbott, who published his original paper in *Natural Science* in 1897 (vol. x., p. 89). I have seen Mr. Abbott's specimens, which are of quite a different order from those with which this letter deals. The number of flints recovered from the workshop site at Cromer now amounts to 249, and they comprise cores, half-finished and complete implements of Early Palæolithic Chellean forms, rostro-carinates, choppers, flake implements, racloirs or side scrapers, points, scrapers of ordinary type, and simple flakes. The majority of the specimens are of massive size, and indicate that the people who shaped them were capable of delivering flake-removing blows of great accuracy and strength. One very large artefact, weighing 7 lb. 6 oz., is flaked into the form of a massive rostrate implement, and, if not used in both hands, could have been wielded only by an individual possessed of great strength and size of hand. The occurrence of several examples at the Cromer

site of implements exhibiting flaking upon two opposite surfaces, which approximate in their form to the earliest Chellean artefacts, leads me to regard the whole assemblage of ochreous flints as referable to this cultural stage.

The presence of such an industry in a stratum of, apparently, Upper Pliocene age would seem to be of some interest and importance, and I hope to exhibit the Cromer flints, and to describe them in detail, in the near future.

J. REID MOIR.

Ipswich, January 20.

MR. REID MOIR has submitted sixty of the yellow-stained worked flints from beneath the Forest Bed of the Cromer shore to me, and has asked me to add a few words to his brief report. They are a most impressive collection on account of their abundance, frequently large size, and uniform lustrous surface and orange-brown colour. I have no doubt of their having been shaped by man. Very usually one surface of the flint is a flat orange-brown area produced by a single blow. Others show flaking on both upper and lower surface. Later marginal chipping—subsequent to the ochreous staining of the flint—appears as blue-grey or as black conchoidal scars. Whilst most of the specimens appear to be eminently fitted for use as rubbers in skin-dressing, some show more complete resemblance to coarsely worked ovate implements of Chellean character, and others are distinctly rostro-carinate. The most remarkable among them is the extraordinarily large and heavy rostrate implement weighing 7 lb. 6 oz. It is 10 in. in length and measures 5 in. in breadth and 4 in. in thickness at the butt-end. This huge implement is most definitely shaped by flaking of undoubted human origin. It is almost free from ochreous-yellow stain. Careful drawings of it of the natural size must be published for the use of archaeologists. The whole "find" deserves really accurate illustration by figures giving both the actual size and the natural colour. The cost of such illustration is beyond the resources of our learned societies, but may possibly be met by the generosity of those who have enthusiasm for "prehistorics."

E. RAY LANKESTER.

January 29.

Modern Pass and Honours Degrees.

ALLOW me to express agreement with the article on "Scientific Education in the Metropolis" in *NATURE* of January 20, p. 653, where you deprecate the premature specialisation of a so-called honours degree under modern regulations, as contrasted with the old plan whereby a pass degree in a great variety of subjects had to be taken before specialisation in one subject was allowed. In the old days all the subjects were compulsory, and the range of knowledge required for Matriculation and for First and Second B.Sc. was quite considerable. A candidate who graduated with credit under those strenuous conditions might fairly be considered educated—to some extent even in the Humanities; and, at any rate, he had a severe training in working at subjects for which he had no special aptitude, but of which he ought not to be ignorant, as well as at those subjects which could be assimilated by him without effort.

I hold that the pass degree system in a modern university, if of a proper standard, as it was and I hope still is at the University of Birmingham, for instance, is generally of far more value to candidates and more helpful to their future development than a narrowly specialised course, which is so much easier.

A man is engaged on his own specialty more or

less all his life, but unless he gains access to the outlying districts of knowledge during his student stage, and under the stimulus of preparation for an examination test, he may never know anything about those other subjects at all.

Reference to an old London University Calendar will show the list of subjects that had individually and separately to be taken and passed in during my own student period—in addition to any attempt to carry some one or more to a higher grade so as to secure specific honours tested by a separate and supplementary additional paper:—

Matriculation.	First B.Sc.	Second B.Sc.
Latin	Mathematics (Trig. and Conics)	Organic Chemistry
Greek		Physiology
French or German	Physics	Geology and
Arithmetic and	Inorganic Chemistry	Palæontology
Algebra		Logic and Moral
Geometry	Zoology	Philosophy.
English Language	Botany.	
English History		
and Geography		
Mechanics		
Chemistry.		

Then, on this basis of general knowledge, the doctorate gave an opportunity of carrying some subdivision of one of these subjects to a very much higher stage. Options must be allowed sooner or later, of course, but the question is how soon an option should be allowed. A multitude of options at an early stage is liable to produce a crop of specialists. Such a crop may be necessary for the world's work, but the process of raising it can scarcely be called an education suited to the development of a human being.

While writing, and without presuming to comment on anything concerning London organisation, may I, as an outsider, venture to express a hope that Finsbury Technical College will not be closed? The admirable work done there in the past, and the great names associated with it, entitle it to be held in honour. Let us hope that its benefits will be continued to a generation seemingly more desirous of instruction than ever before.

OLIVER LODGE.

January.

Heredity and Biological Terms.

Will you allow me space for a short comment on the recent discussion in *NATURE* on Sir Archdall Reid's letters? The chief point raised by Sir Archdall Reid seems to me to be of great importance, and very far from being a side-issue. The usual custom of speaking of "characters" in living beings as either "innate" or "acquired": the product of either nature or nurture: or of describing them by other pairs of terms of similar import, does lead to much confusion in the minds of many when studying the production of "characters," and very especially that of human characters. Some seventeen years ago, when making a study of this kind, I was aided greatly by many communications I had with Sir Archdall Reid, and particularly by an article entitled "Biological Terms," published in the final number of *Bedrock* in 1914, which virtually sets forth the main position advocated by him in the present discussion. I do not intend to touch on any conflicting views on modes of hereditary transmission which may enter into this discussion, but are not strictly relevant to Sir Archdall Reid's main contention, except to say that the particular difficulty which he points out and strives to conquer can concern only those biologists who do not regard the modern Lamarckian hypothesis as established, or

even as verisimilar. If that hypothesis were verified the whole contention would fail.

Sir Archdall Reid's chief point is that it would be a great benefit to science if all branches of it which deal with life adopted a like classification of "characters." At present biologists generally classify characters as "innate" or "acquired," while physiologists tend to classify characters from the point of view of the influences, or "nurture," which produce them. He takes, for instance, the case of a hand, a sixth digit on it, and a scar on it. The physiologist says all these characters are products of some kind of nurture, and tries to find out what kind it is. That is the physiologist's business. The biologist, concerned mainly with "nature," says the hand and the sixth digit are "innate" and the scar "acquired." In a certain sense both are right. But the physiologist's language implies that all "characters" are both inborn and acquired, while the biologist's implies that some are "inborn" and some "acquired." The language of the physiologists is always clear, while that of the biologists is very often obscure. Hence, probably, the absence among physiologists of the great divergences of opinion which exist among biologists.

Physiologists are mainly concerned with the development of the individual; biologists with heritage and evolution (or change in the heritage). Assuming that most biologists of the present day hold that heritage passes down the germ-tract, may it not be argued justly that if the child has a hand like the parent, there is no change in "nature" or "nurture"; that if the child has a sixth digit which the parent had not, there is a change in nature, or heritage, but none in "nurture"; and that if the child has a scar, there is no change in heritage, but only one in nurture? It therefore appears to me that Sir Archdall Reid's chief contention is very soundly based. If we think of a hand, scar, and sixth digit as "characters," as the physiologist does, they are all alike products of nature and nurture (innate and acquired); if we think of them as *likenesses and differences between individuals*, the hand indicates an innate likeness, the digit an innate difference, and the scar an acquired difference; and if we think of them in terms of the *germ-plasm*, the hand and the scar indicate no change, but the digit is a change (or, in biological language, a "variation").

The burden of Sir Archdall Reid's complaint is that biologists have thought and expressed themselves in terms of "characters," not of the germ-plasm; and that this has largely caused the misleading question, widespread beyond all scientific borders, as to whether "nature" or "nurture" is the stronger influence. This is especially notable in relation to the production of "characters" in the higher animals, and most of all to that of the most distinctive characters of man. Sir Archdall Reid thus insists that a vague terminology has caused neglect of the evolution of the power of developing in response to functional activity; and that, with a more precise terminology, the simple statement, "*Variations are the sole cause of non-inheritance; apart from variations, like exactly begets like when parent and child develop under like conditions,*" will cover almost the whole field and thus leave biology free to deal with the many problems of immense scientific and practical importance which concern it.

In my own inquiries I have found that the common assumption of human characters being rigidly divisible as to their origin into two groups, "innate" or "acquired," constitutional or environmental, is a cause of much confusion; and I think that the import of Sir Archdall Reid's exposition of this matter has